Air Quality Trends and Monitoring Evaluation

Presented by

State Advisory Board
Air Quality Status and Trends Work Group

November 3, 2004

Air Quality Status and Trends Work Group

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- John Daniel
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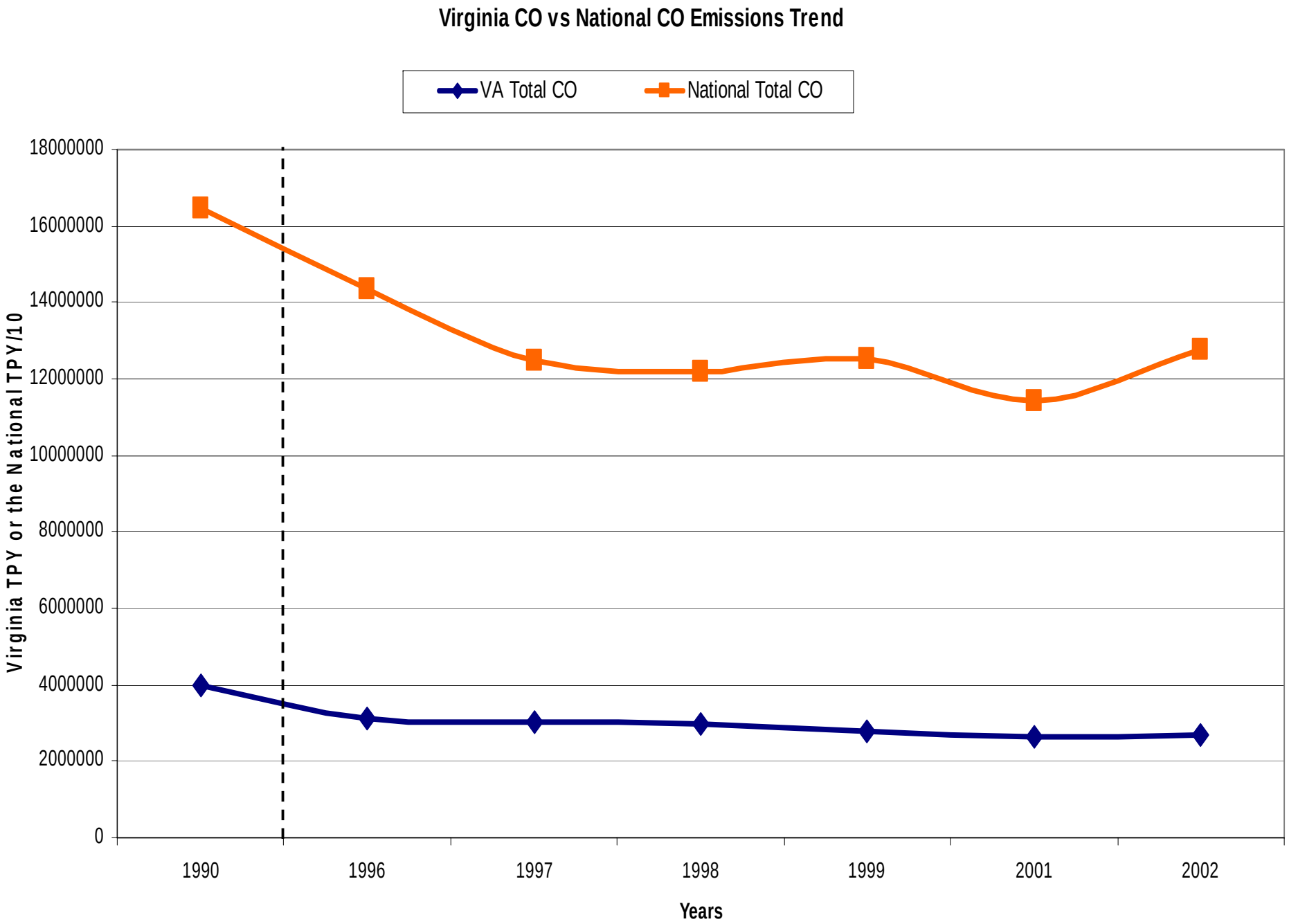
Mission

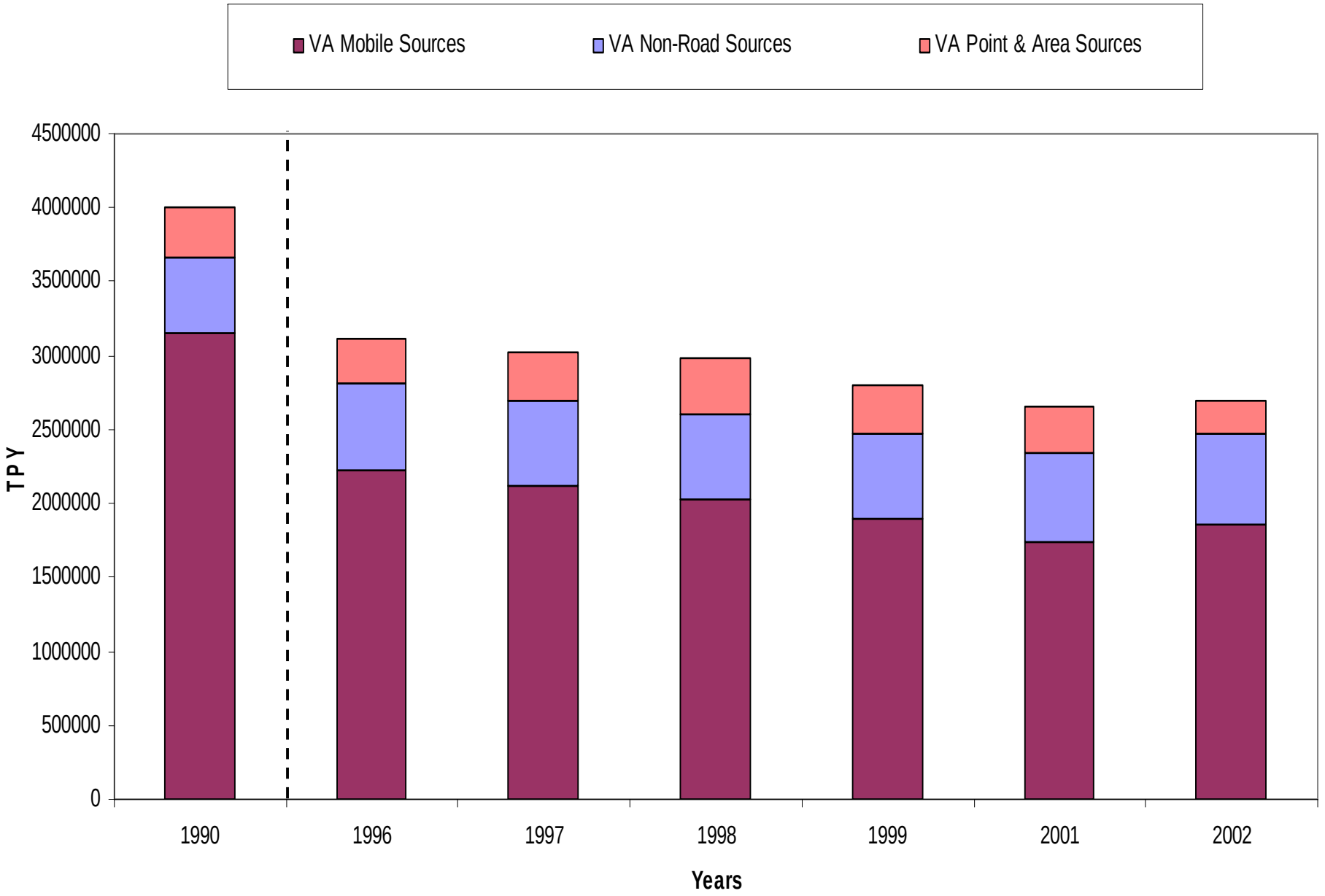
- Provide an assessment of air quality status and trends nationally and in Virginia with regard to criteria air pollutant emissions,
- Compare these trends to population trends, and vehicle miles traveled trends,
- Evaluate the need for additional air quality monitors in Virginia for pollutants of concern.

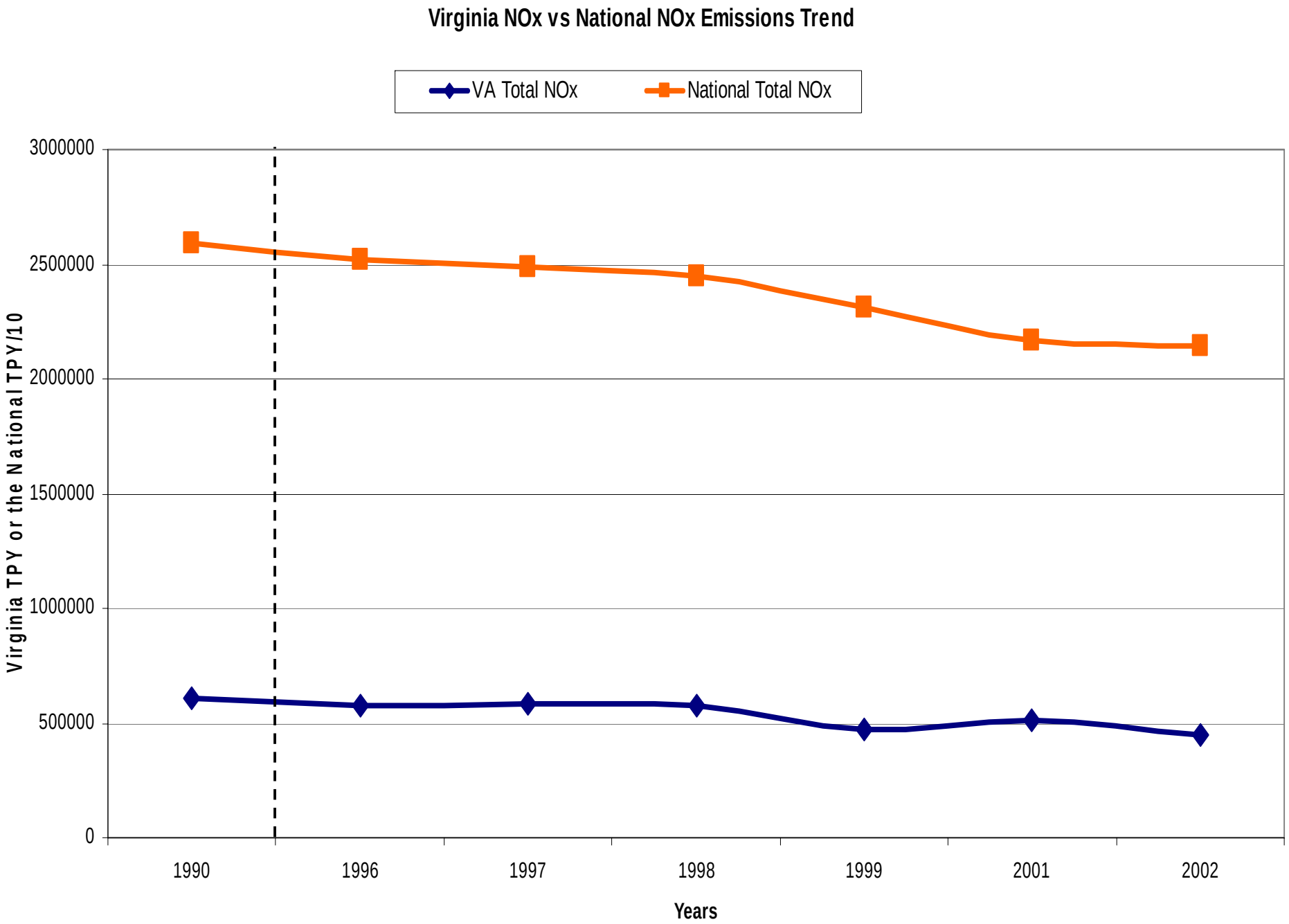
Air Quality Data

National & Virginia

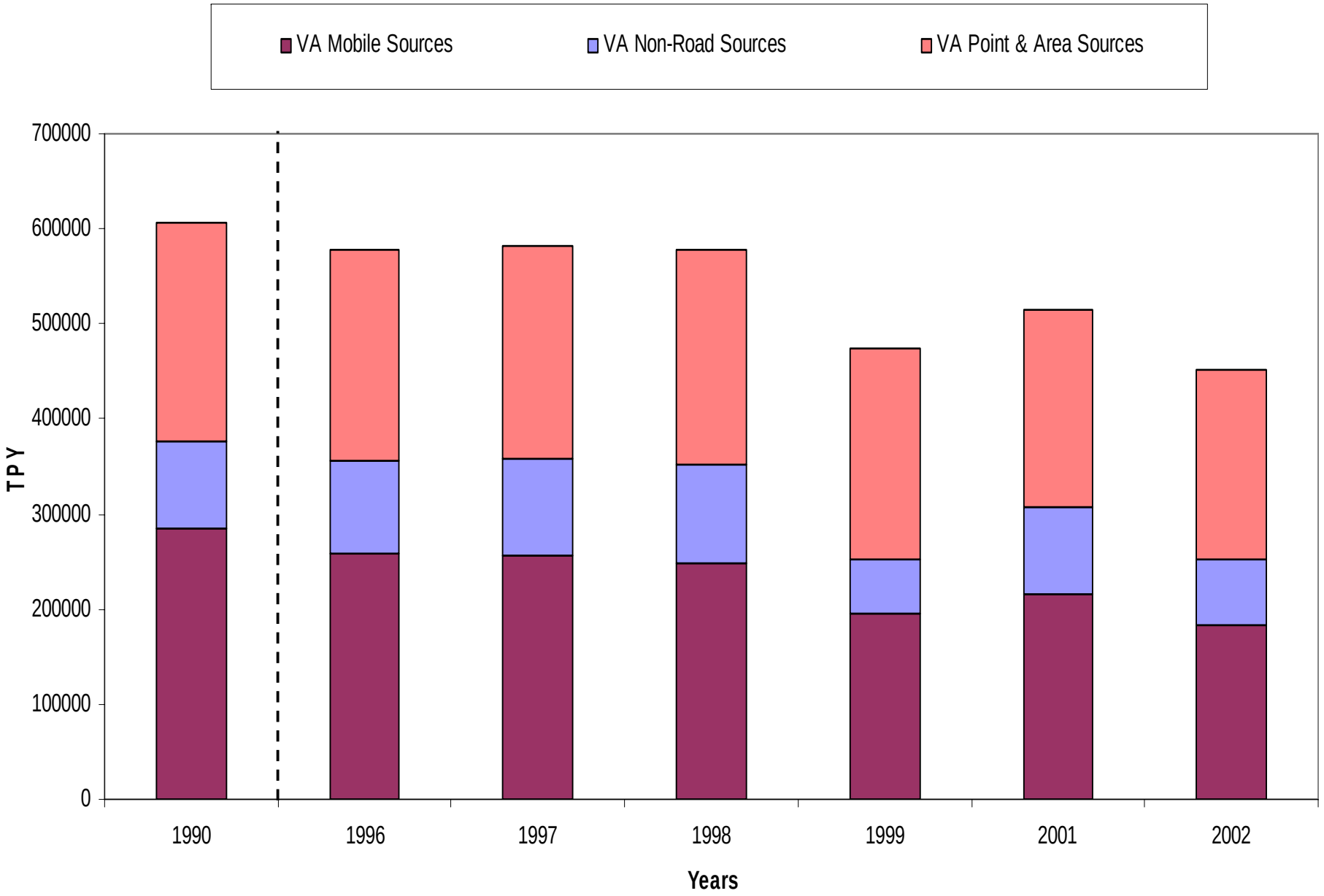

Virginia CO vs National CO Emissions Trend
VA Total CO
National Total CO
18000000
16000000
14000000
12000000
10000000
8000000
6000000
4000000
2000000
0
Virginia TPY or the National TPY/10
1990
1996
1997
1998
1999
2001
2002
Years

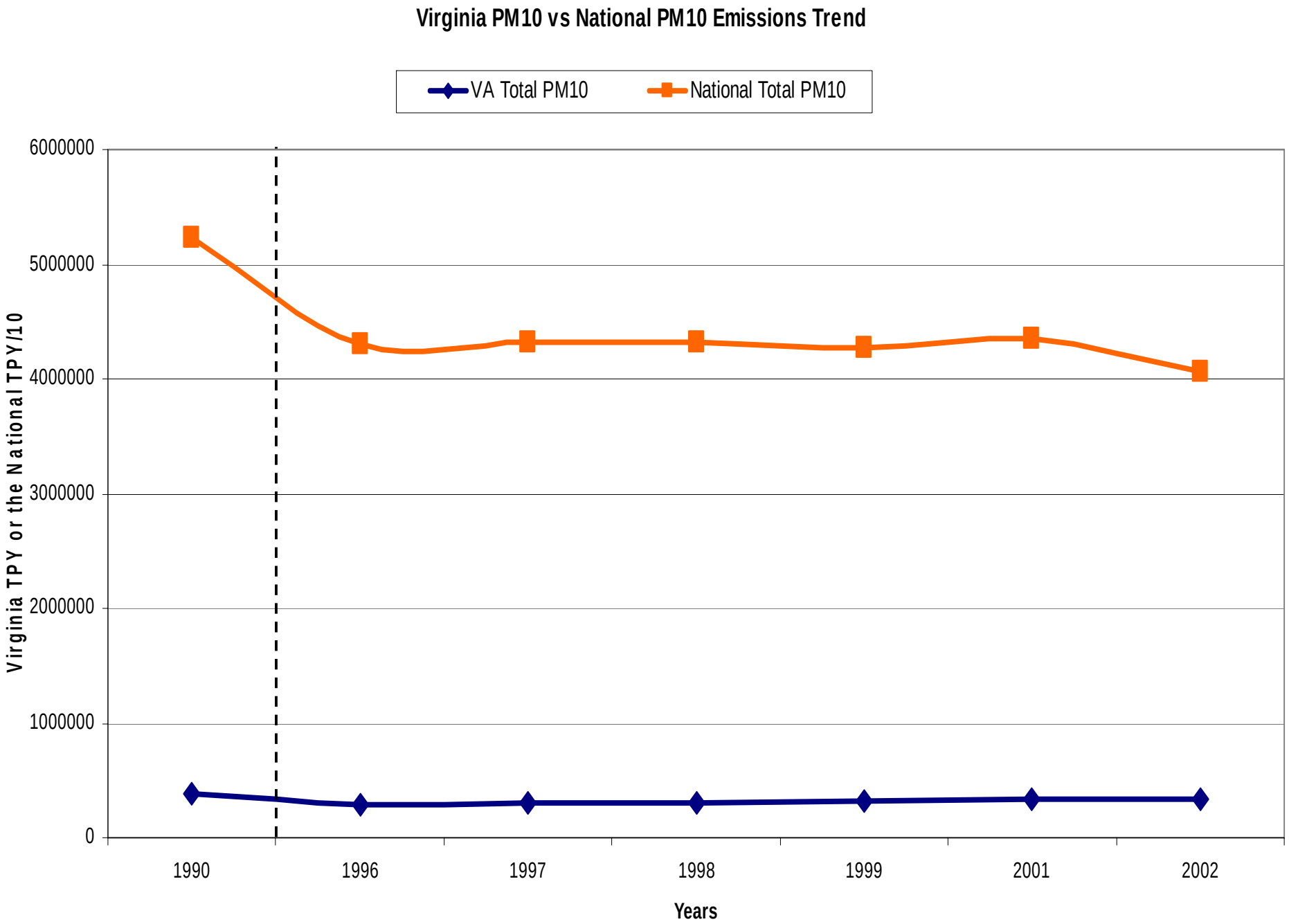
Virginia CO Emissions Trend



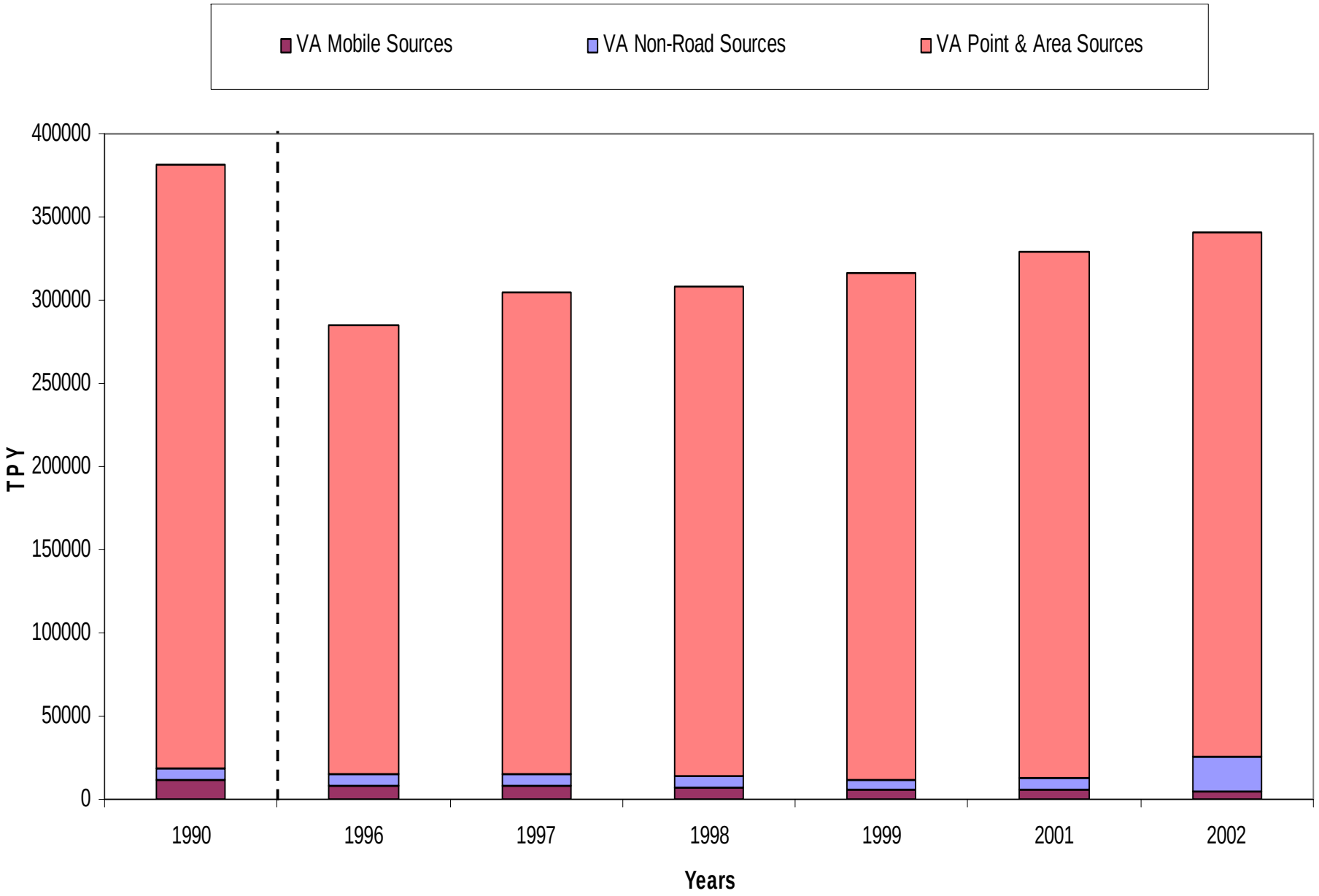

Virginia NOx vs National NOx Emissions Trend
VA Total NOx
National Total NOx
3000000
2500000
2000000
1500000
1000000
500000
0
Virginia TPY or the National TPY/10
1990
1996
1997
1998
1999
2001
2002
Years

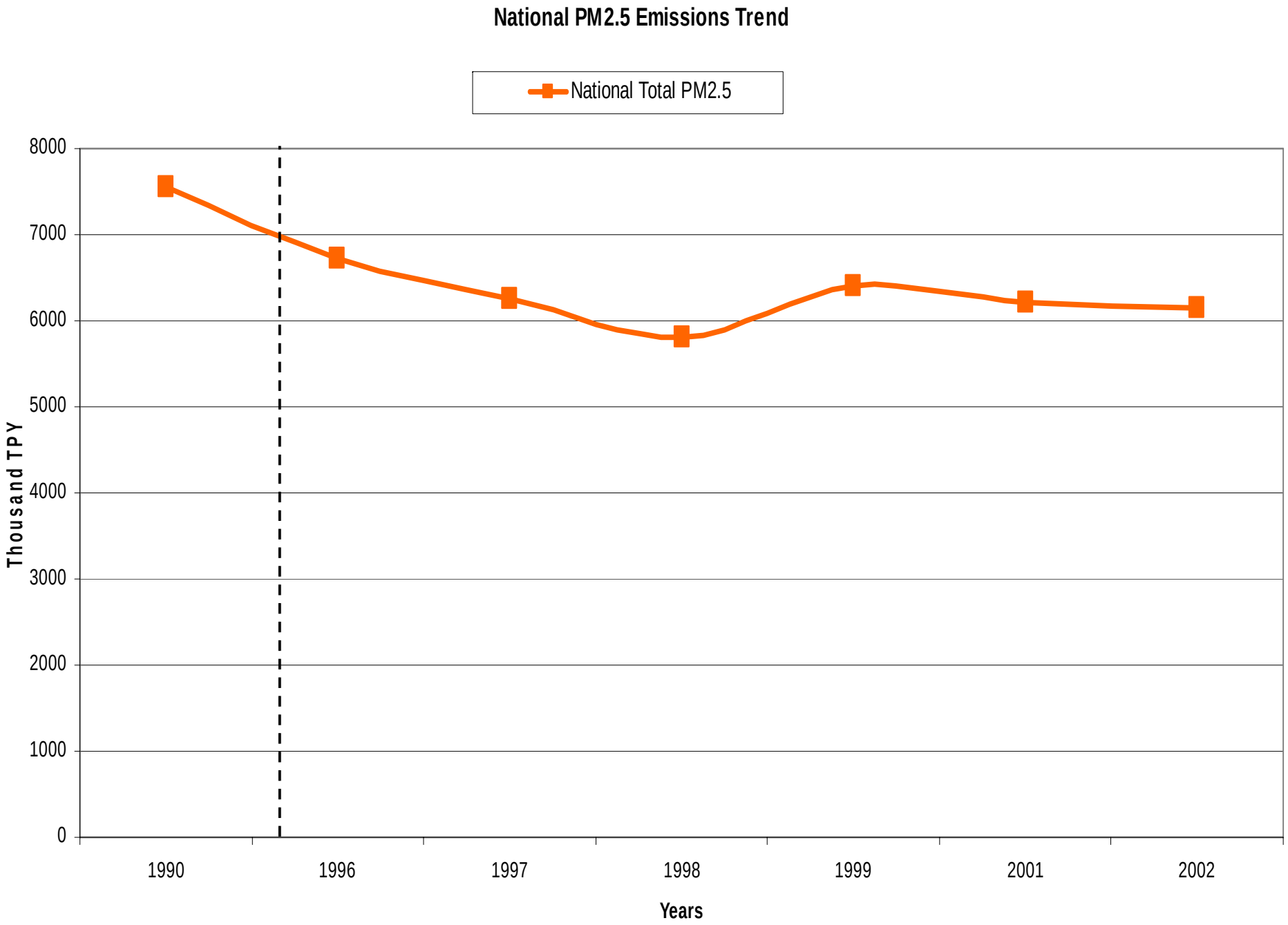
Virginia NOx Emissions Trend

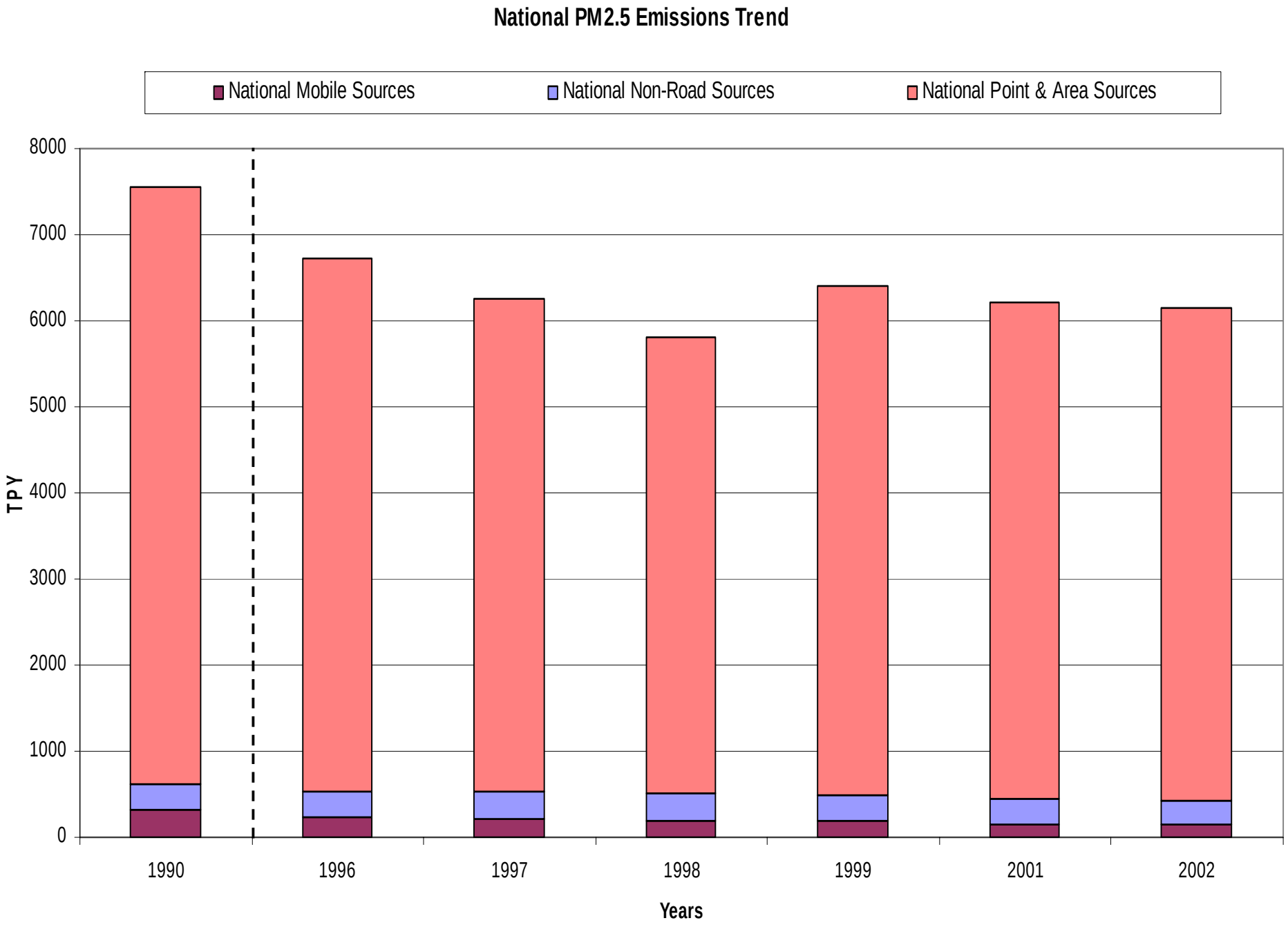


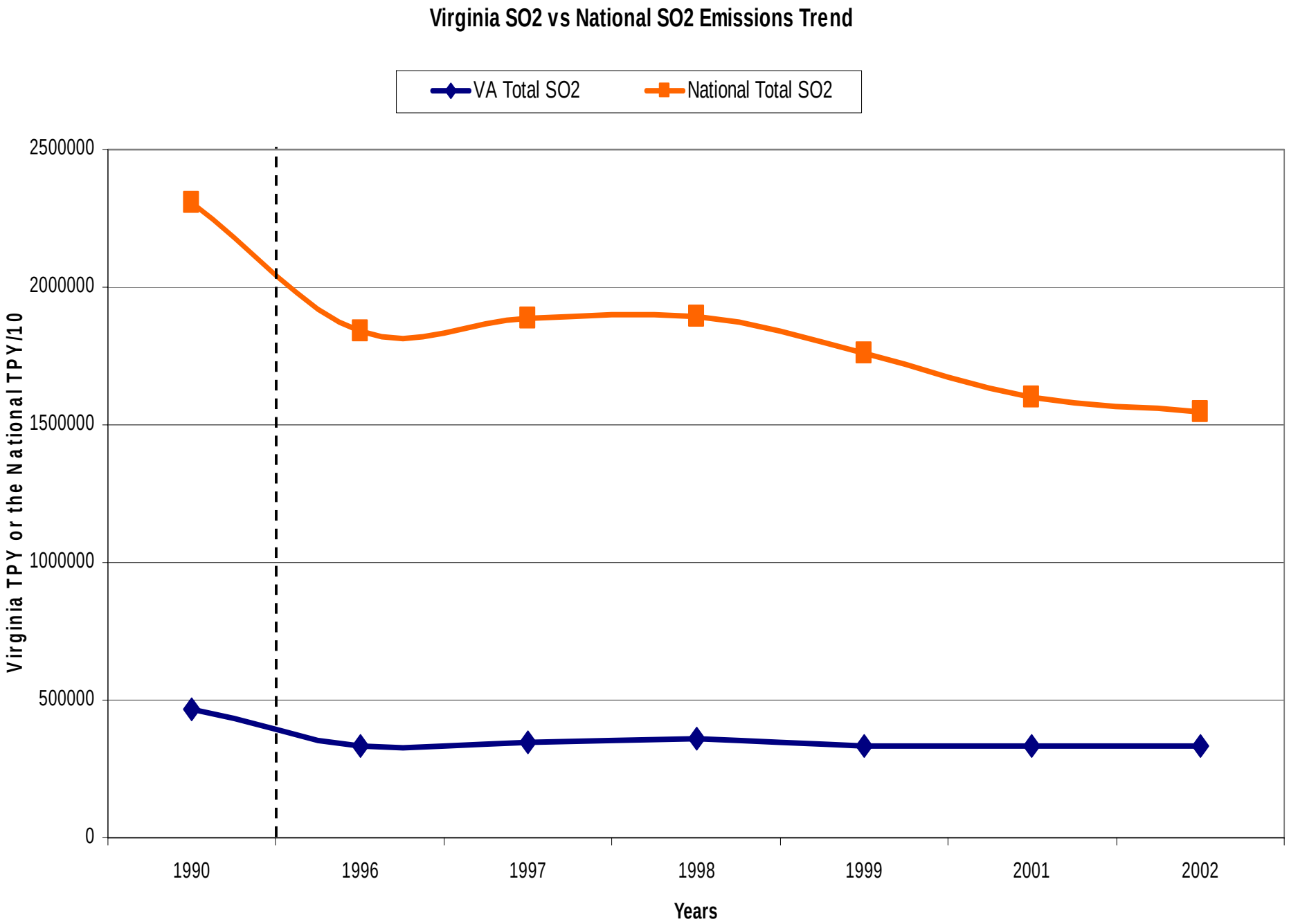

Virginia PM10 vs National PM10 Emissions Trend
VA Total PM10
National Total PM10
6000000
5000000
4000000
3000000
2000000
1000000
0
Virginia TPY or the National TPY/10
1990
1996
1997
1998
1999
2001
2002
Years

Virginia PM10 Emissions Trend

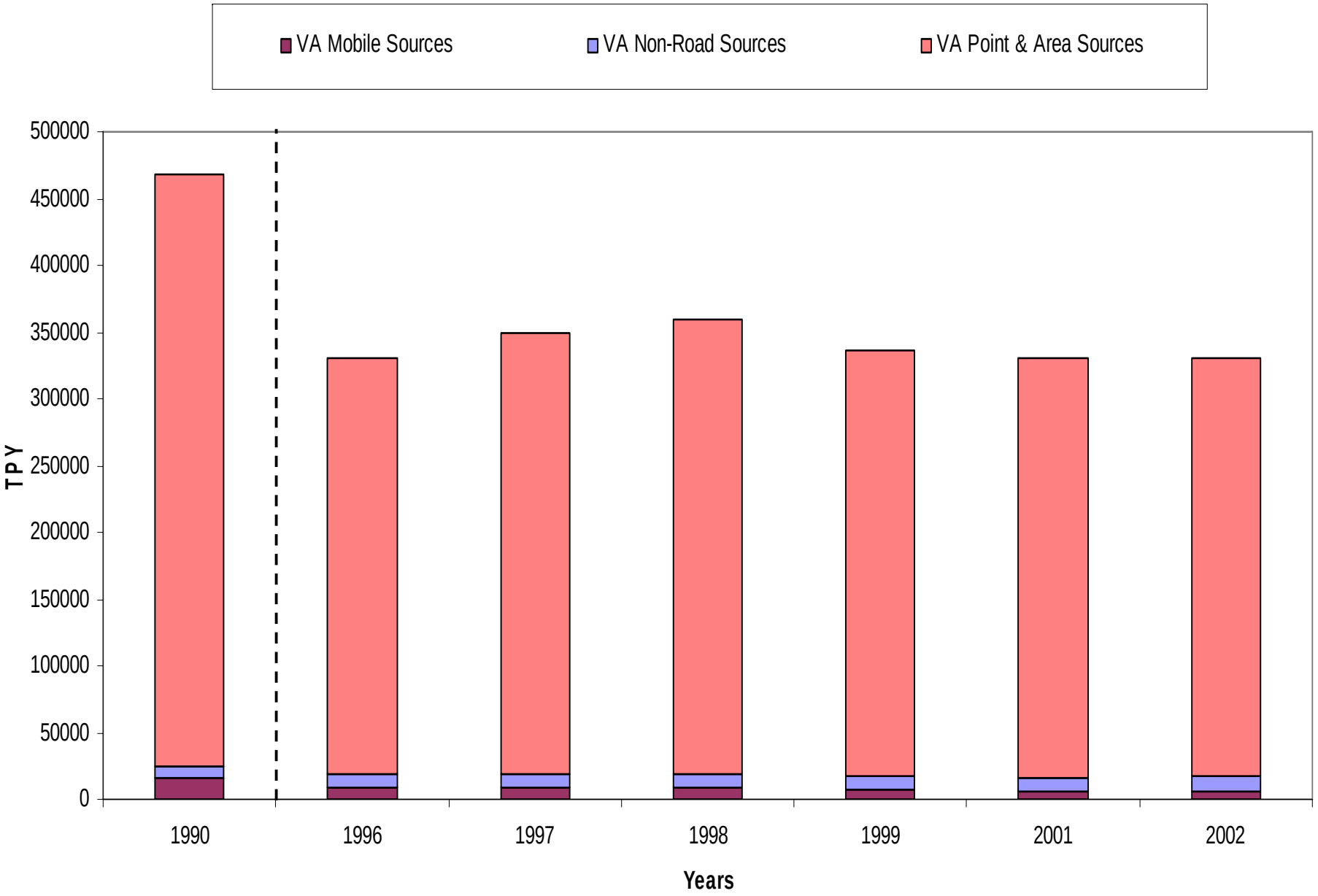


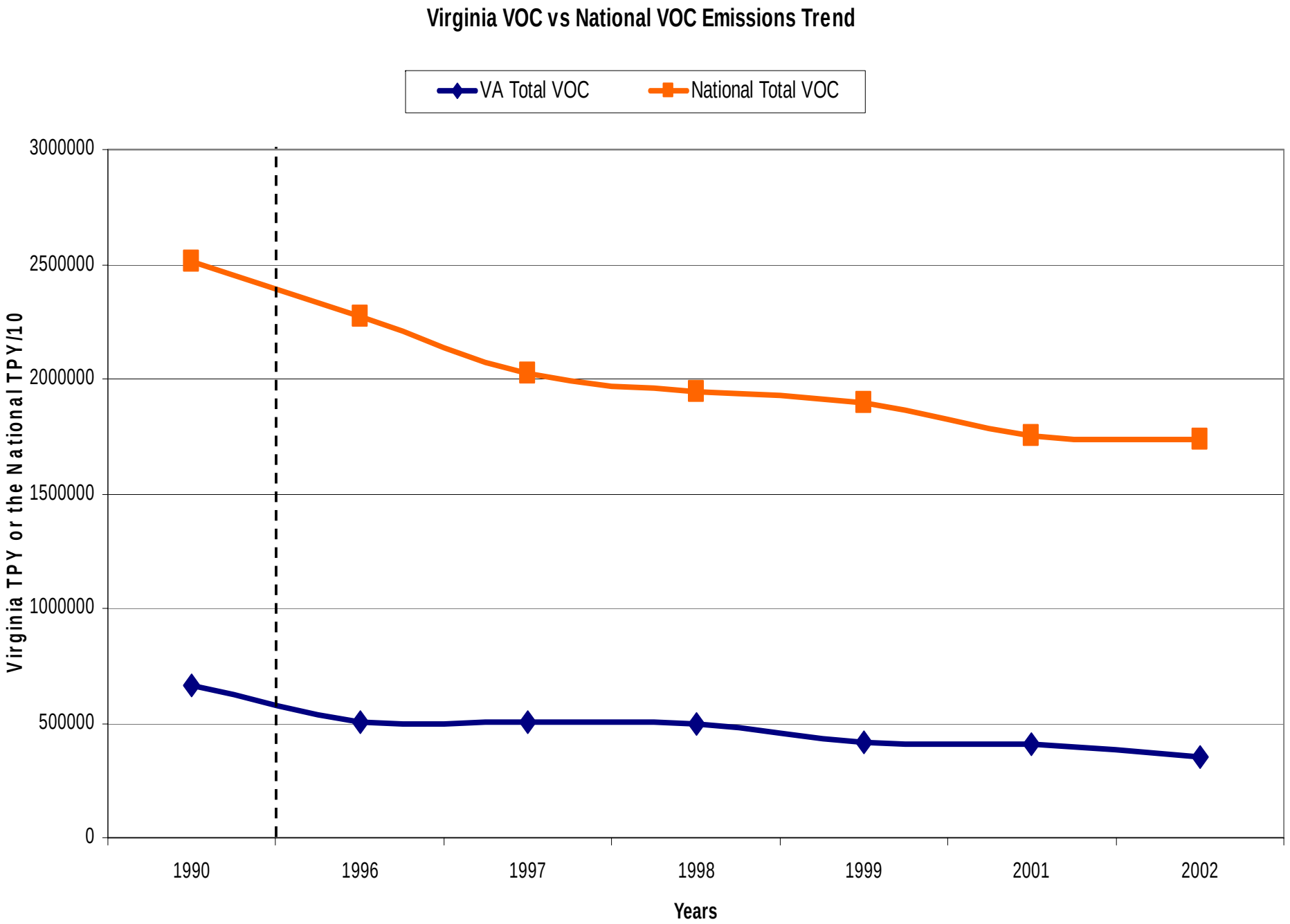

National PM2.5 Emissions Trend
National Total PM2.5
8000
7000
6000
5000
4000
3000
2000
1000
0
Thousand TPY
1990
1996
1997
1998
1999
2001
2002
Years


National PM2.5 Emissions Trend
National Mobile Sources
National Non-Road Sources
National Point & Area Sources
8000
7000
6000
5000
4000
3000
2000
1000
0
TPY
1990
1996
1997
1998
1999
2001
2002
Years

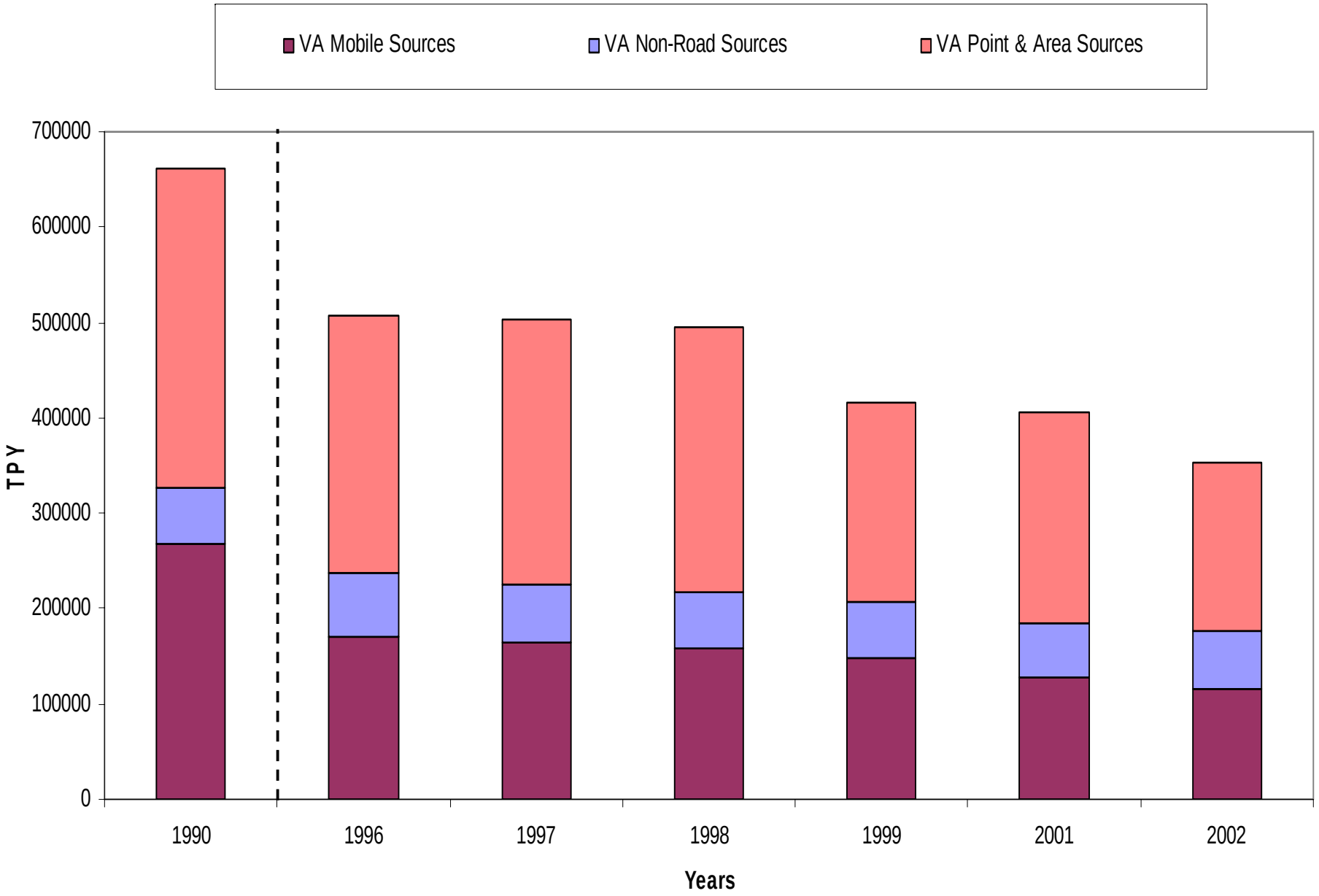

Virginia SO2 vs National SO2 Emissions Trend
VA Total SO2
National Total SO2
2500000
2000000
1500000
1000000
500000
0
Virginia TPY or the National TPY/10
1990
1996
1997
1998
1999
2001
2002
Years

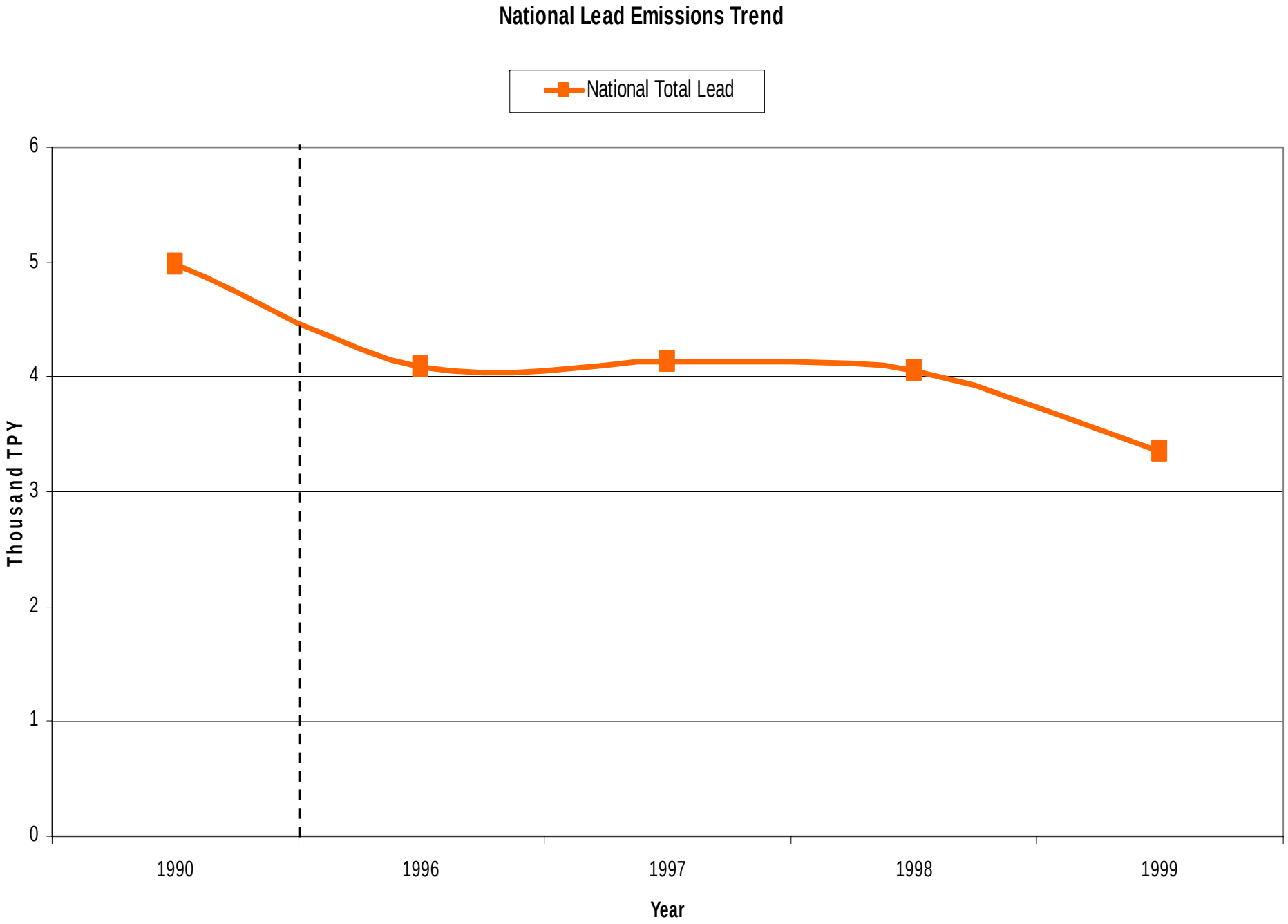
Virginia SO2 Emissions Trend

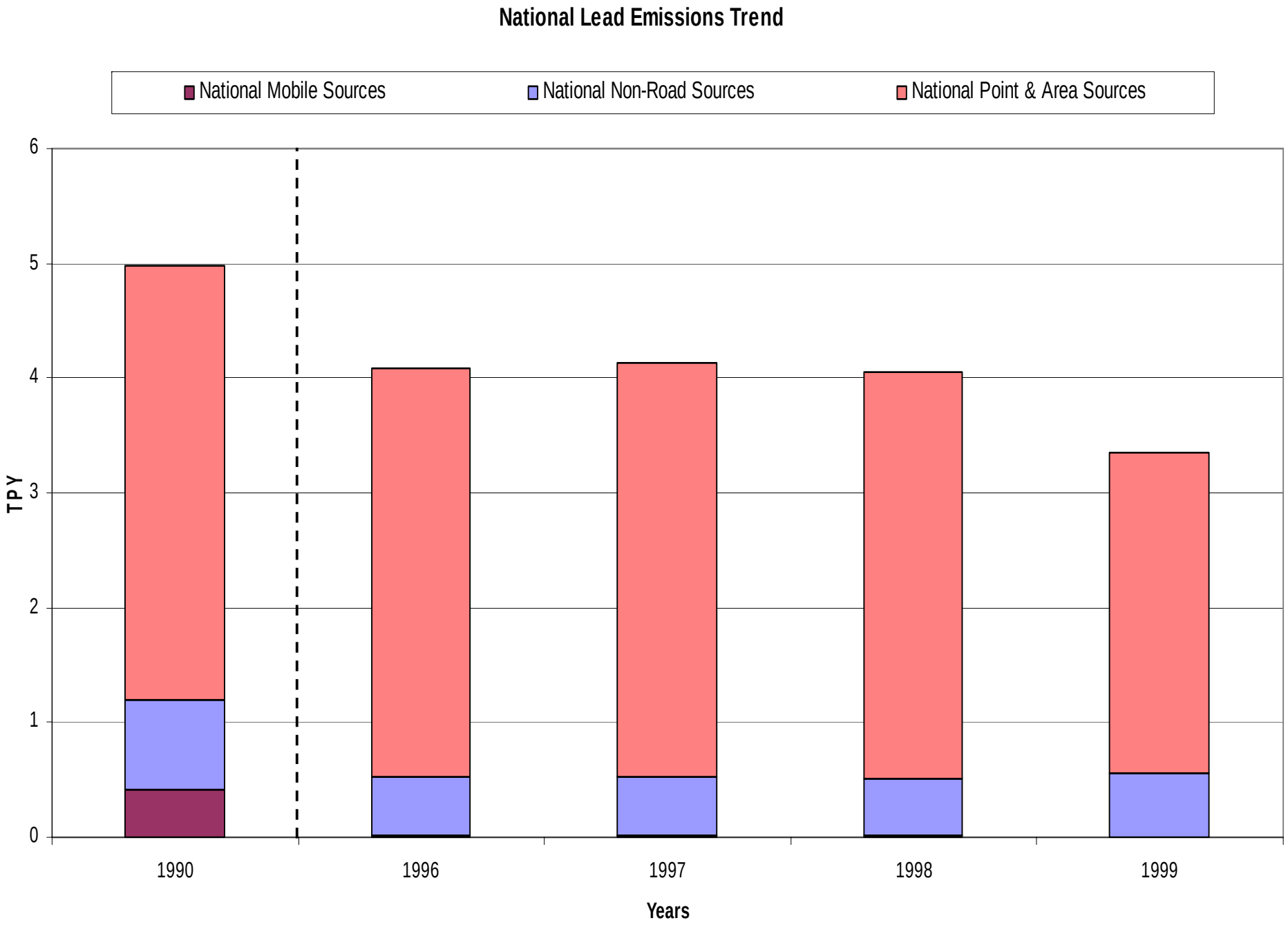



Virginia VOC vs National VOC Emissions Trend
VA Total VOC
National Total VOC
3000000
2500000
2000000
1500000
1000000
500000
0
Virginia TPY or the National TPY/10
1990
1996
1997
1998
1999
2001
2002
Years

Virginia VOC Emissions Trend




National Lead Emissions Trend
National Total Lead
6
5
4
3
2
1
0
Thousand TPY
1990
1996
1997
1998
1999
Year


National Lead Emissions Trend
National Mobile Sources
National Non-Road Sources
National Point & Area Sources
6
5
4
3
2
1
0
TPY
1990
1996
1997
1998
1999
Years

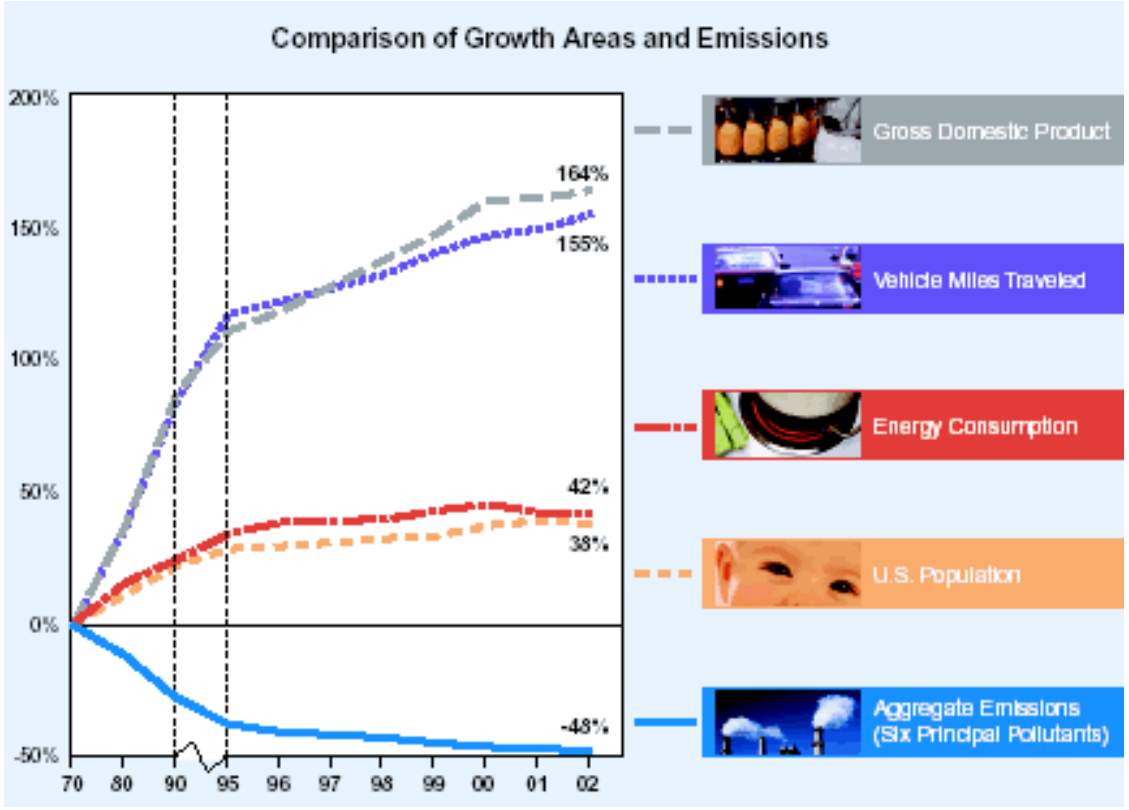
Summary

- The largest contributors to CO and NOx emissions in Virginia today are mobile sources.
- The largest contributors to PM10, VOC, SO2, and emissions in Virginia are point and area sources.
- The data shows that significant improvements in air quality occurred in Virginia since 1990.
- The overall emission trends in tons/year of pollutants since 1996 are decreasing for all pollutants in Virginia except for PM10 which has increased slightly. (only national trends were available for PM2.5 and lead).
- One of the reasons for the decrease in emissions is the EPA's Acid Rain Program already in effect.

Impacts of EPA's Acid Rain Program

- In 2002, sources of SO2 in the Acid Rain Program emitted 10.2 million tons, down from 15.7 million tons in 1990.
- Emissions of SO2 in 2002 were 400,000 tons less than in 2001.
- NOx emissions from all Acid Rain Program sources have also declined since 1990.
- NOx emissions have decreased from 6 million tons in 1997 to 4.5 million tons in 2002.
- The more than 1,000 sources affected by the Acid Rain NOx Program emitted 4.1 million tons in 2000, approximately 1.5 million tons (25 percent) less than they did in 1990.
- NOx emissions from these sources in 2001 were 3.6 million tons (over 40 percent) below what emissions were projected to have been in 2000 without the Acid Rain Program.

Trends & Regulatory Activities



SAMI State Trends

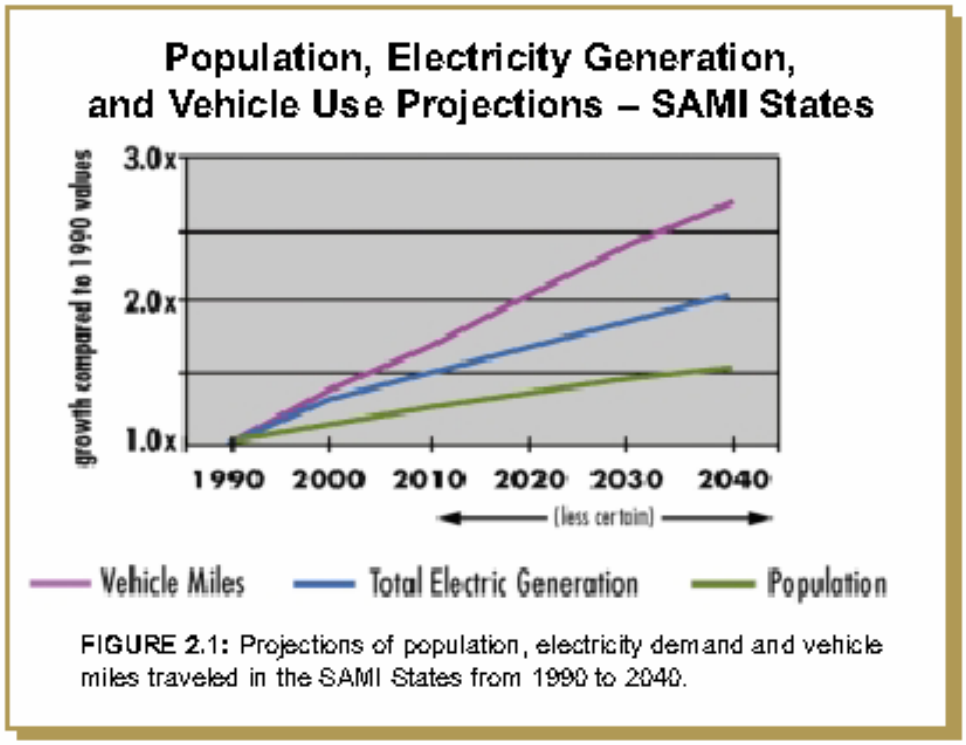
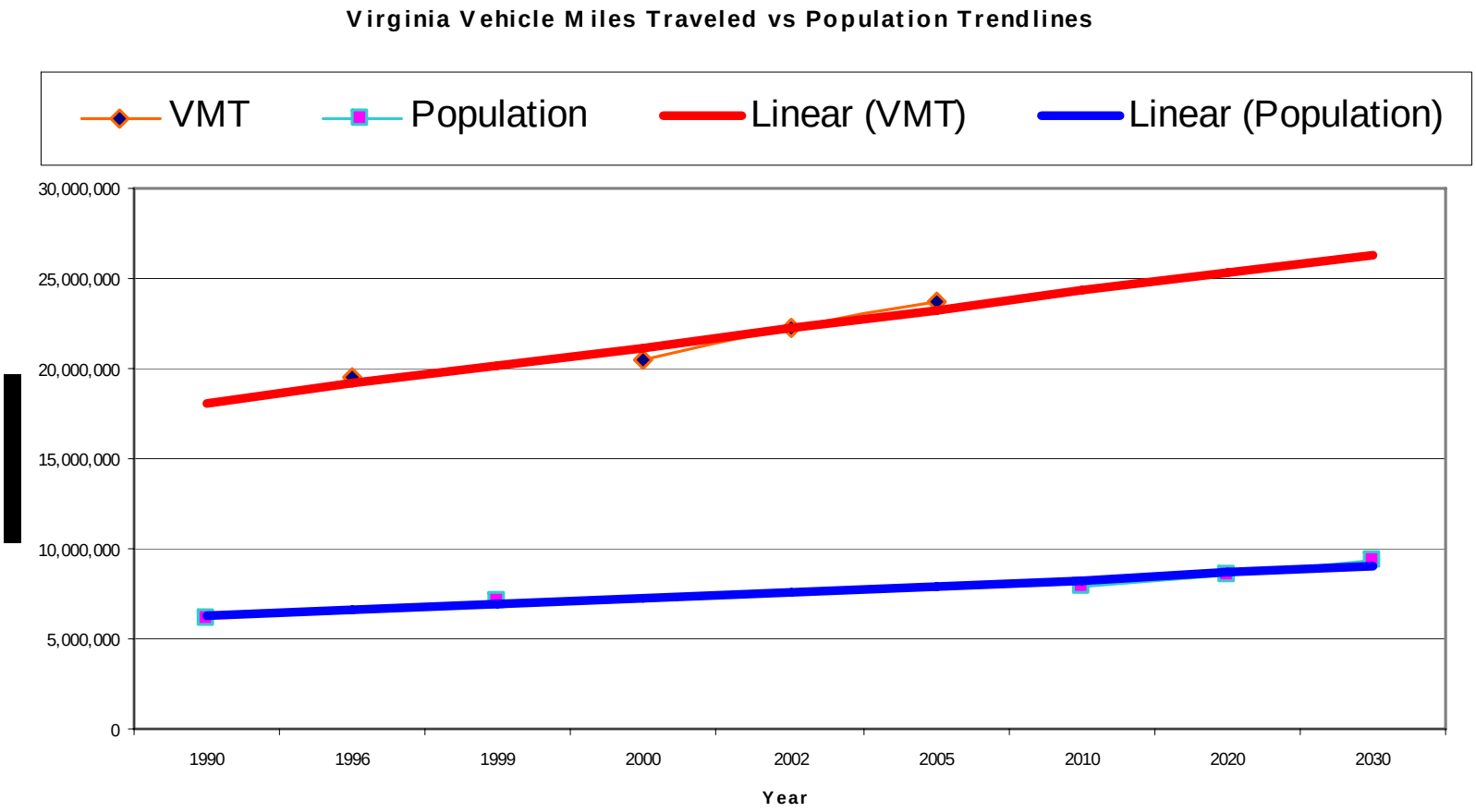


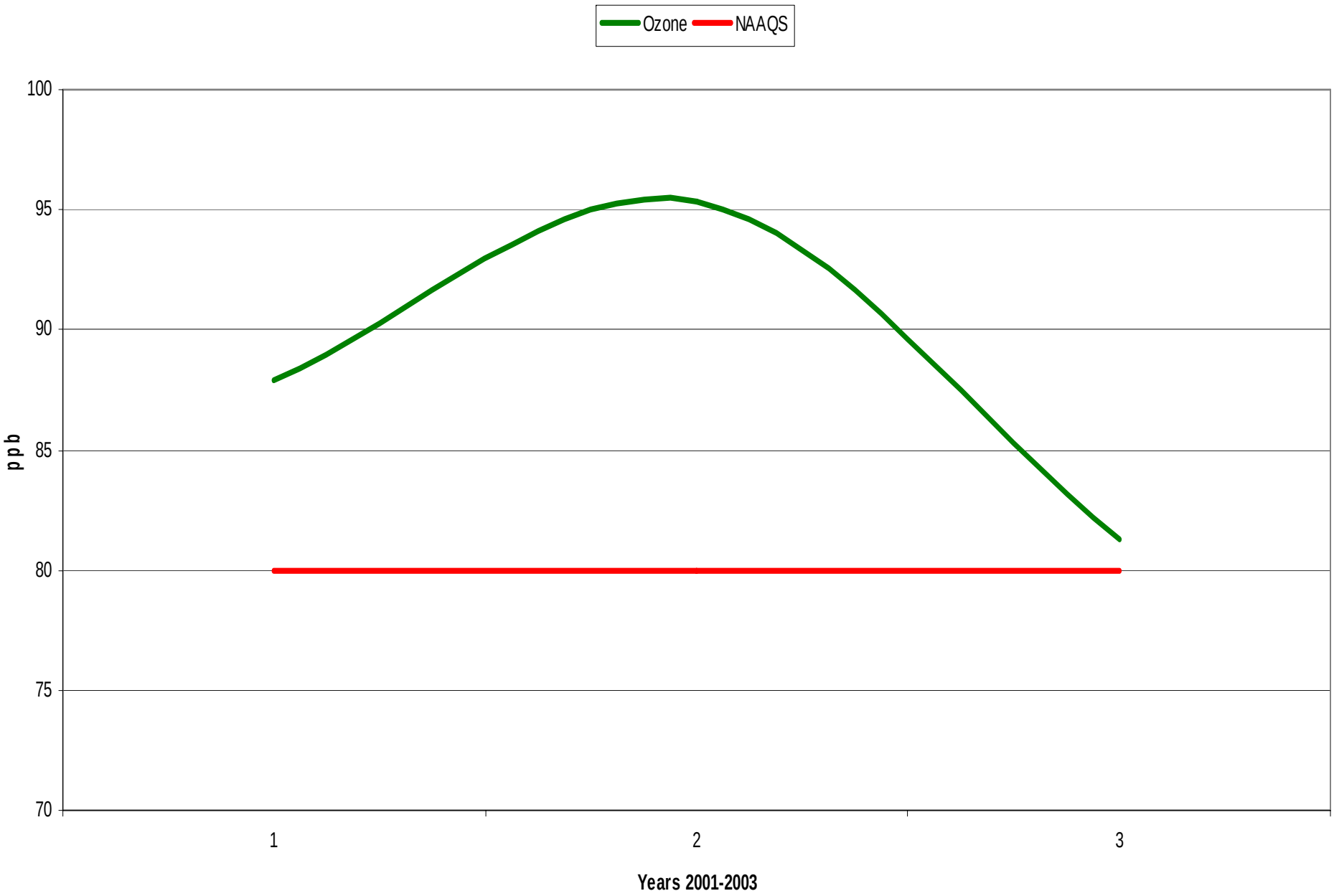
FIGURE 2.1: Projections of population, electricity demand and vehicle miles traveled in the SAMI States from 1990 to 2040.

Virginia Trends



Air Quality Data

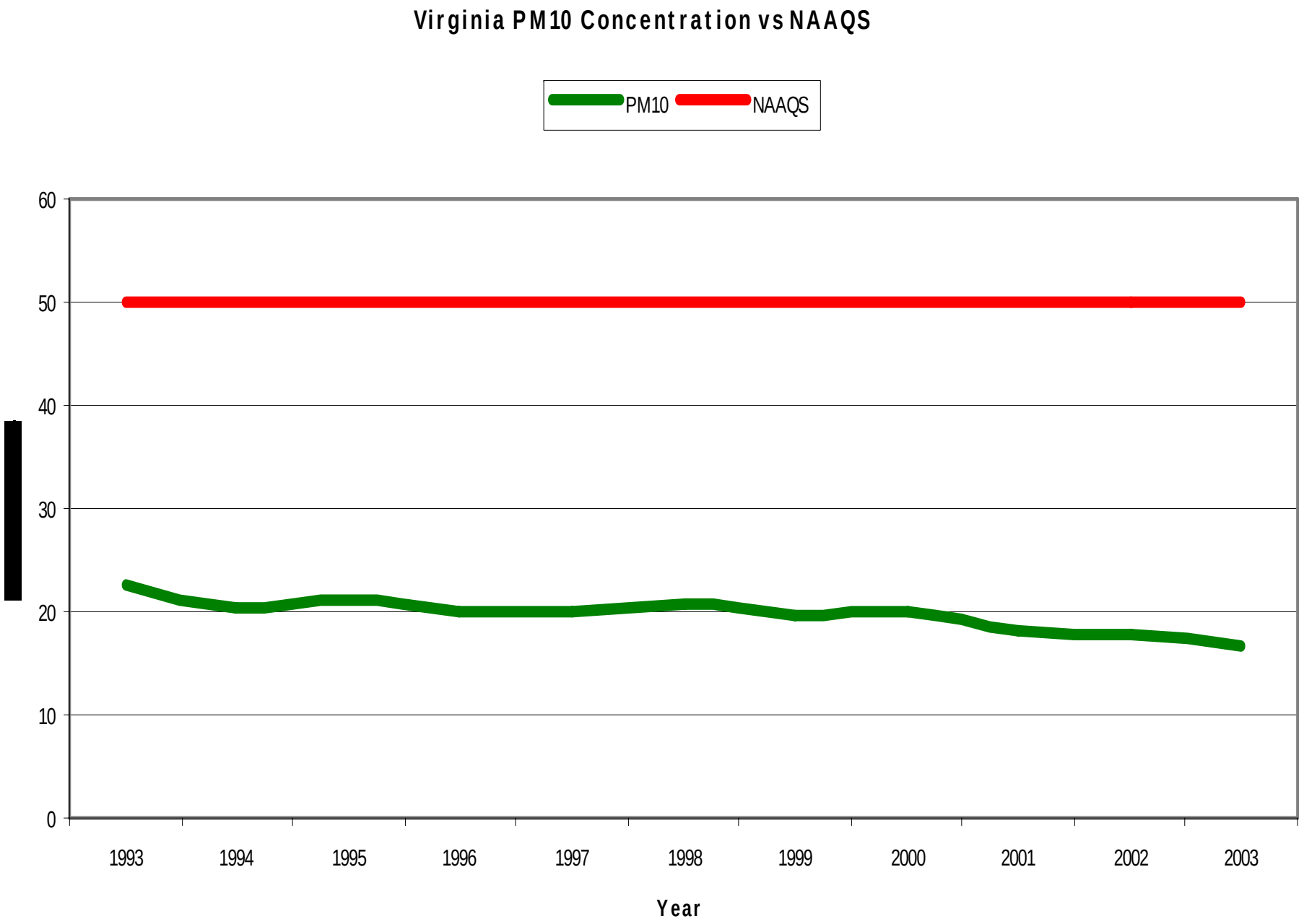
Virginia vs NAAQS

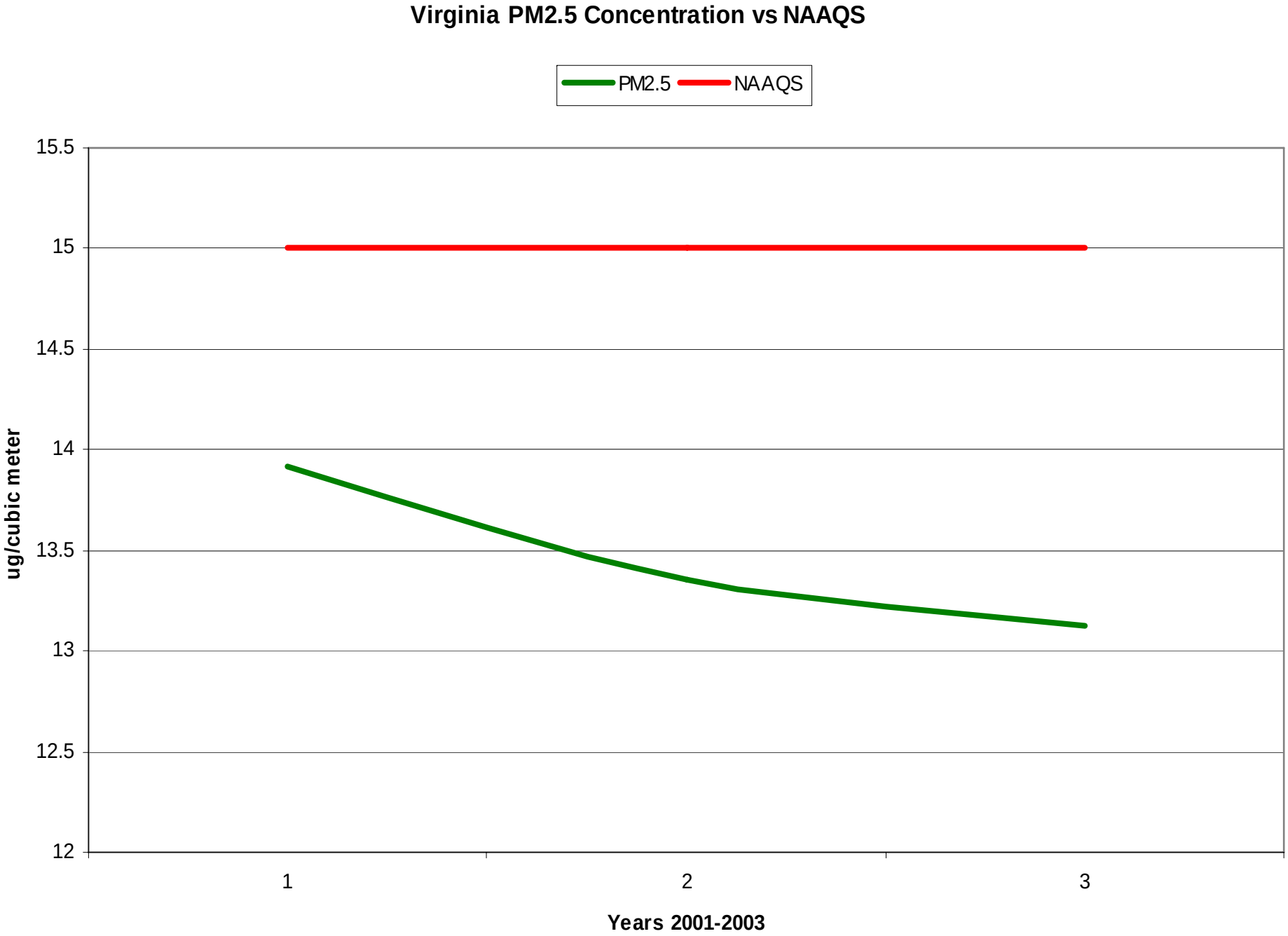

Virginia Ozone Concentration vs NAAQS
Ozone
NAAQS
100
95
90
85
80
75
70
ppb
1
2
3
Years 2001-2003

Virginia Department of Environmental Quality
2001-2003 Fourth Highest Daily Maximum Ozone 8-hour Averages
Units, ppb

Monitoring Sites	2001	2002	2003	3-year average
Roanoke Co.	89	91	77	85
Rockbridge Co.	82	78	75	78
Page Co.	86	79	83	82
Frederick Co.	86	91	79	85
Fauquier Co.	82	84	76	80
Caroline Co.	86	85	81	84
Richmond Area:				
Chesterfield Co.	86	93	78	85
Henrico Co.	91	98	83	90
Hanover Co.	91	106	84	94
Charles City Co.	89	105	78	90
Tidewater Area:				
Hampton	85	102	83	90
Suffolk - TCC	85	98	83	88
Suffolk - Holland	75	92	79	82
Northern Virginia Area:				
Loudoun Co.	93	102	83	92
Stafford Co.	86	94	85	88
Prince William Co.	89	87	79	85
Arlington Co.	98	112	81	97
Alexandria	91	103	80	91
Fairfax Co. - Lee Park	96	108	87	97
Fairfax Co. - McLean	90	99	75	88
Fairfax Co. - Mt. Vernon	95	106	91	97
Fairfax Co. - Chantilly	93	92	83	89
Fairfax Co. - Annandale	Installed 2002	108	83	NA
Madison Co. - Shenandoah National Park	90	86	86	87

(Site operated by the National Park Service)

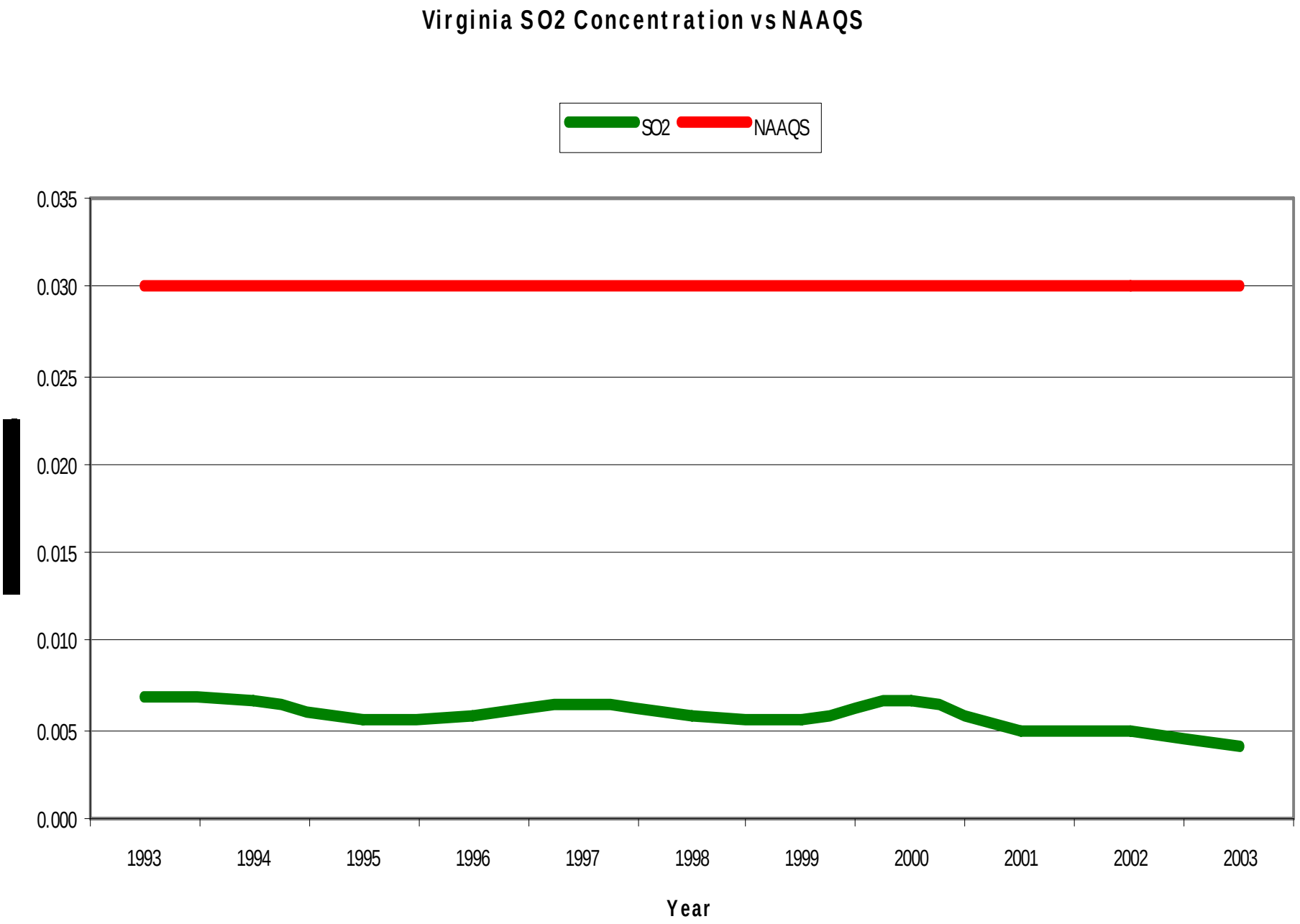

Virginia PM10 Concentration vs NAAQS
PM10
NAAQS
60
50
40
30
20
10
0
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

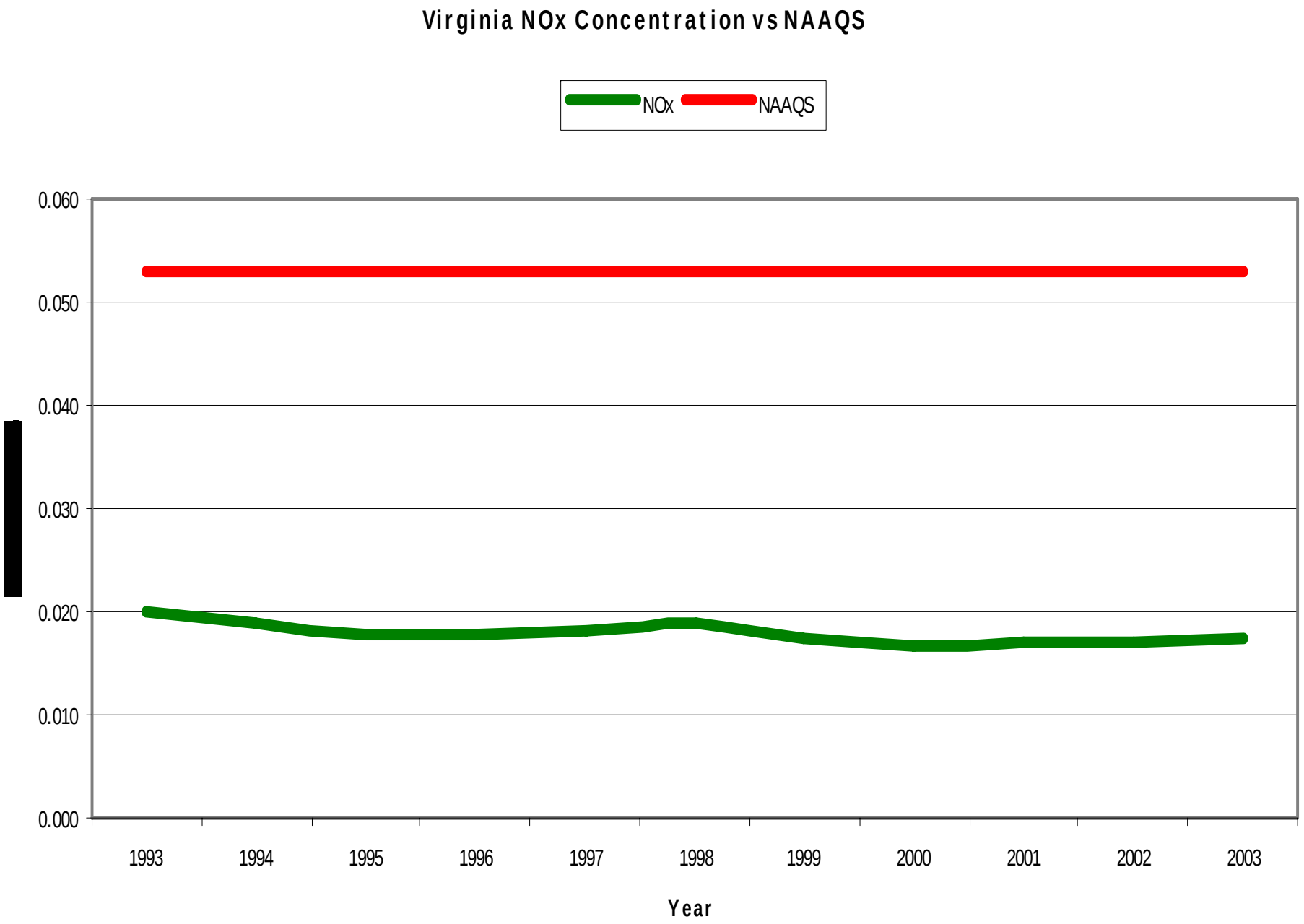

Virginia PM2.5 Concentration vs NAAQS
PM2.5
NAAQS
15.5
15
14.5
14
13.5
13
12.5
12
ug/cubic meter
1
2
3
Years 2001-2003

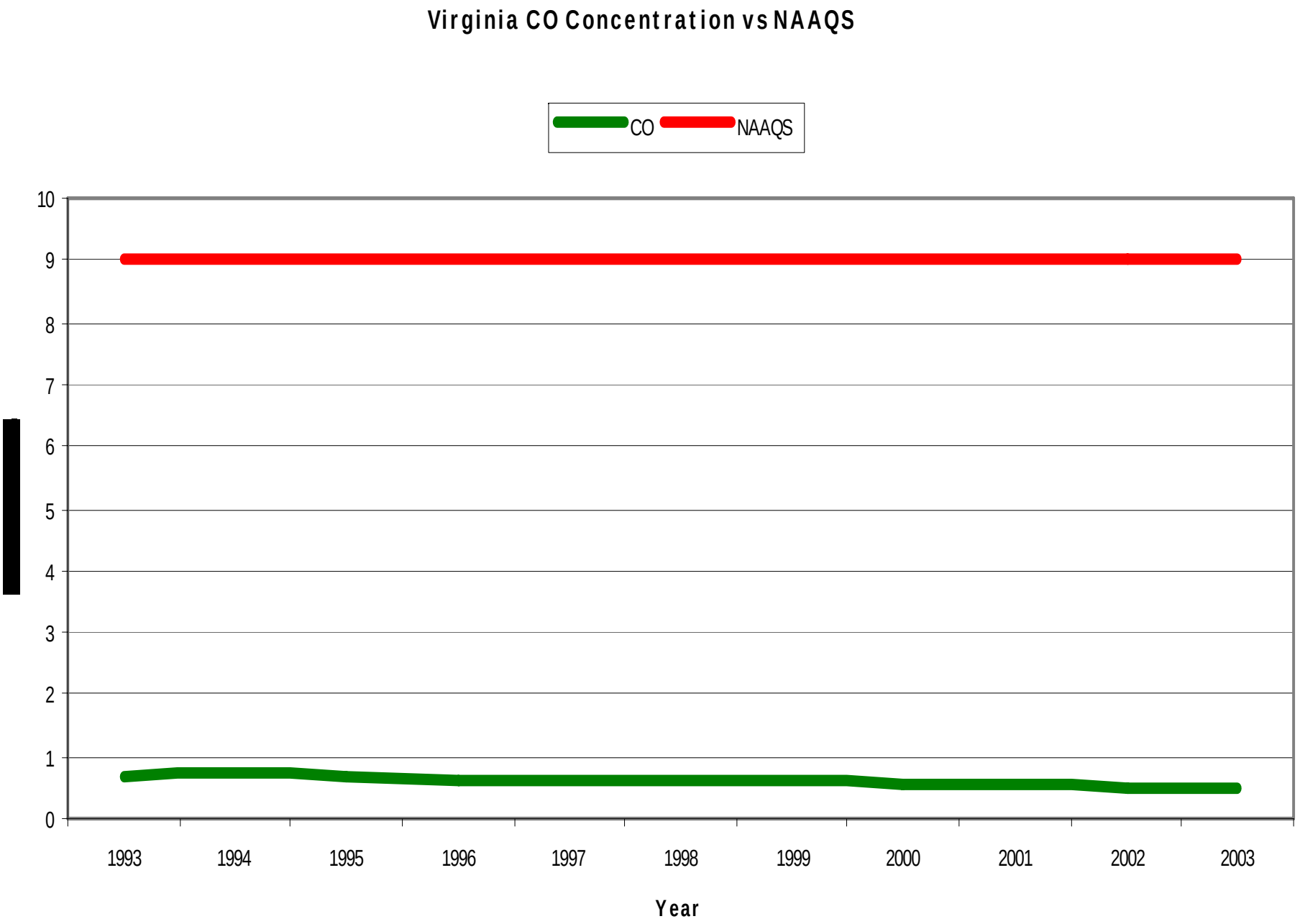
Virginia Department of Environmental Quality
2001-2003 PM2.5 Annual Arithmetic Means
Units, Micrograms per Cubic Meter

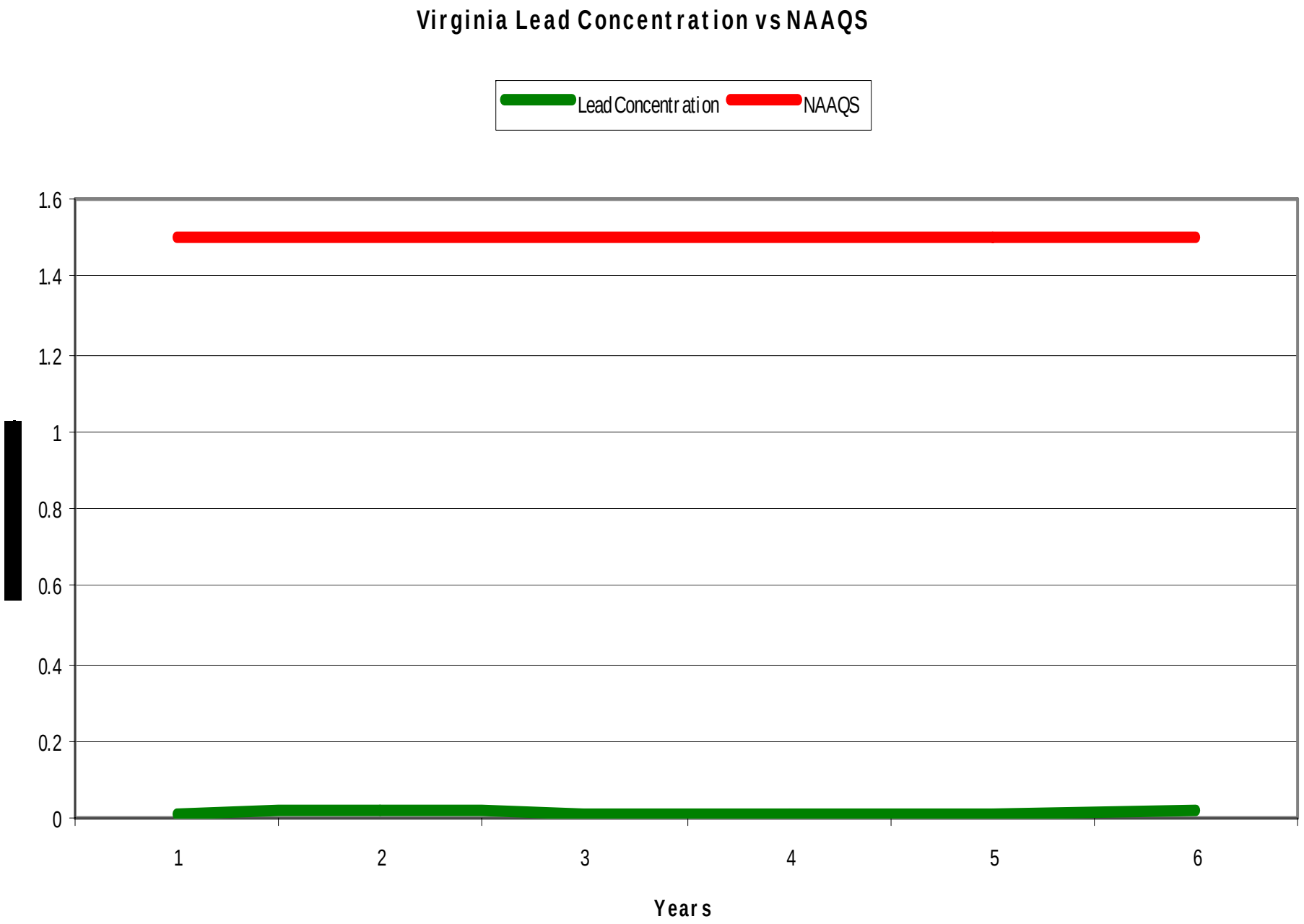
County/City	2001	2002	2003	3-Year Average
Southwest Virginia Area:				
Bristol	15.2	14.1	13.8	14.4
Roanoke/Lynchburg Area:				
Roanoke	14.8	14.4	13.5	14.2
Salem	15.1	15.1	13.8	14.7
Lynchburg	14.4	13.8	Discontinued	NA
Lynchburg			NA	NA
Richmond Area:				
Chesterfield Co.	13.8	13.5	13.6	13.6
Henrico Co. - Math & Science Ctr.	13.5	13.7	14.0	13.7
Henrico Co. - DEQ Piedmont Office	13.0	13.1	12.8	13.0
Charles City Co.	13.6	12.5	12.4	12.8
Richmond	14.7	13.5	13.8	14.0
Tidewater Area:				
Chesapeake	13.5	11.9	12.3	12.6
Hampton	13.6*	11.7	12.4	12.6*
Newport News	12.0	11.9	11.8	11.9
Norfolk	13.6	12.6	12.8	13.0
Virginia Beach	12.7	12.4	12.7	12.6
Northern Virginia Area:				
Arlington Co.	14.7	15.0	14.1	14.6
Loudoun Co.	14.1	13.5	13.1	13.6
Fairfax Co. - Lee Park	14.3*	13.2	13.2	13.6*
Fairfax Co. - McLean	14.5	14.2	13.6	14.1
Fairfax Co. - Annandale		13.8*	13.2	NA
Transport Monitoring Site:				
Page Co.	13.3	13.2	12.4	13.0

**** - Incomplete data capture for the year***


Virginia SO2 Concentration vs NAAQS
SO2
NAAQS
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year


Virginia NOx Concentration vs NAAQS
NOx
NAAQS
0.060
0.050
0.040
0.030
0.020
0.010
0.000
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year


Virginia CO Concentration vs NAAQS
CO
NAAQS
10
9
8
7
6
5
4
3
2
1
0
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year


Virginia Lead Concentration vs NAAQS
Lead Concentration
NAAQS
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5
6
Years

Summary of Ambient Concentrations in Virginia

- Ambient concentrations in Virginia for ozone, NOx, PM10, PM2.5, SO2, CO and lead all decreased between 1991 and 1993.
- All pollutants are below the NAAQS, except for ozone, which was above the national ambient air quality standards at a number of monitored locations in the state.
- The PM2.5 concentrations remain about 85% of the NAAQS on average, so PM2.5 also remains a pollutant of concern.

Ambient Air Monitoring Network In Va.

- Previous Air Resources Impact Workgroup Report (2002)
- Objective No. 1
  - Criteria and Sites for New Monitors
- Objective No. 2
  - Using Non-DEQ Monitoring Information

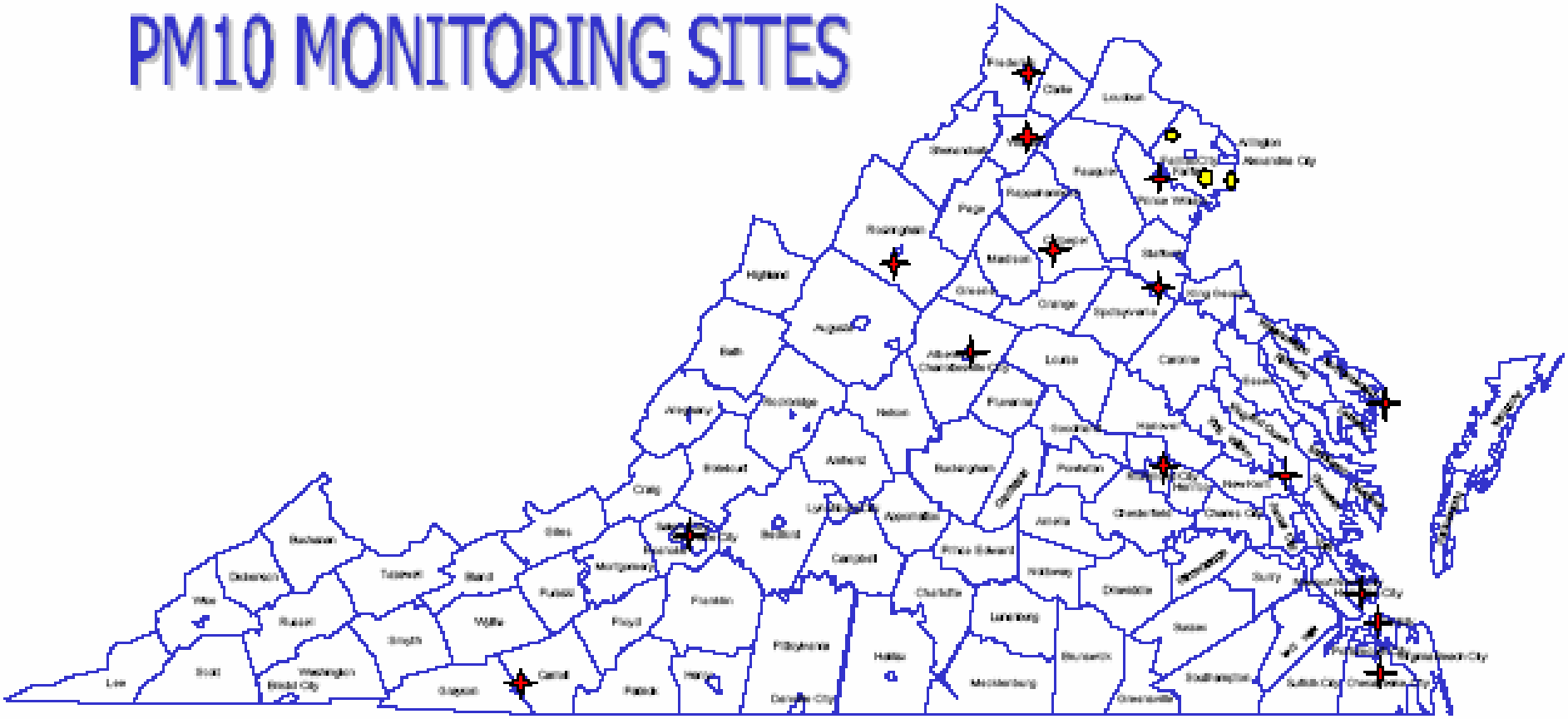
Current Ambient Air Monitoring Locations

OZONE MONITORING SITES

Reporting Organizations

- VA Department of Environmental Quality
- Fairfax County Health Department
- National Park Service

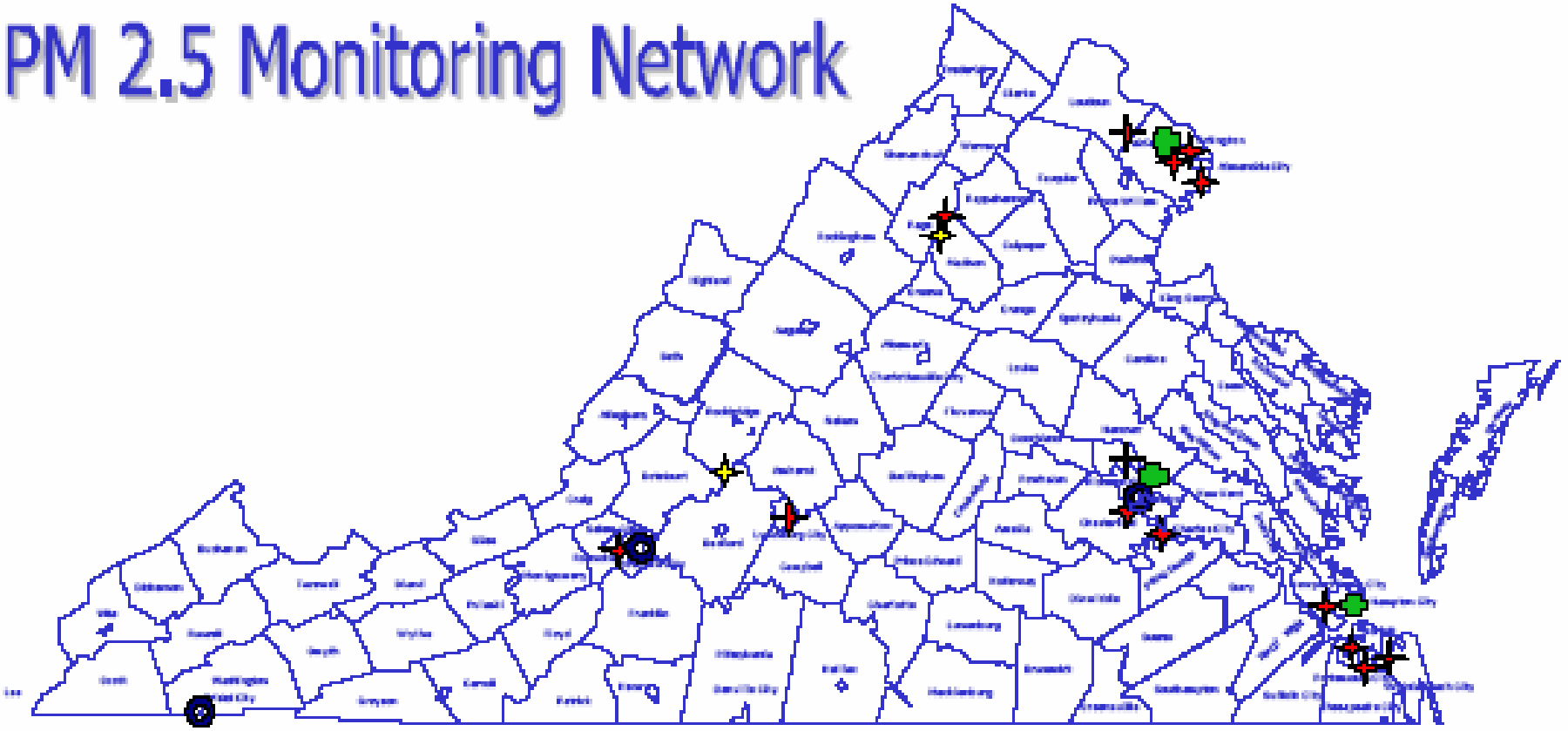
PM10 MONITORING SITES



Reporting Organizations

- VA Department of Environmental Quality
- Fairfax County Health Department

PM 2.5 Monitoring Network



- Mass Sampler
- Improve Network
- Mass and Speciation Samplers
- Mass and TEOM Samplers

Planned Air Pollution Control Initiatives

- **Interstate Air Quality Rule**
- **Utility Mercury Rule**
- **Non-Road Diesel Rule**

Planned Air Pollution Control Initiatives

- **Ozone Rule**
- **Fine Particle Rule**

Planned Air Pollution Control Initiatives

- **Potential Multi-Pollutant Legislation**
  - **Clear Skies Act**
  - **Clean Power Act**
  - **Clear Air Planning Act**

Report Summary

- Emissions in tons/year of CO, NOx, PM10, PM2.5, SO2, VOC, and lead are decreasing nationally.
- All the available Virginia data shows similar decreasing trends in tons/year of emissions except for PM10 which has shown slight increases.

Report Summary

- Concentrations of Ozone, NOx, PM10, PM2.5, SO2, CO and Lead in Virginia were below the NAAQS, except for ozone.
- Concentration of PM2.5 remains at about 85% of the NAAQS (on average) so it also remains a pollutant of concern in Virginia.

Report Summary

- The US and Virginia population and vehicle miles traveled have been on an increasing trend and are projected to increase significantly in the future.
- There are numerous regulations already in place and many more being studied to further reduce emissions of air pollutants.
- There is a gap in the monitoring network for ozone and PM2.5 in the southern, southwestern, and central portions of Virginia.

Recommendations

- Continue to monitor and evaluate with respect to national data and NAAQS.
- Install 4 additional ozone monitors in south and central portions of Virginia due to current exceedances.
- Install 3 additional PM2.5 monitors in south and central portions of Virginia since PM2.5 concentrations remain close to the NAAQS.
- Explore the possibility of using data from non-DEQ organizations as a way of increasing the DEQ monitoring network to save cost.

Thank You